WHAT IS CLAIMED IS:

1. A method for filtering signals to obtain a desired passband of frequencies, the method comprising:

providing a micromechanical filter apparatus including a micromechanical resonator having a fundamental resonant mode formed on a substrate and a support structure anchored to the substrate to support the resonator above the substrate; and

vibrating the resonator so that the apparatus passes a desired frequency range of signals while substantially attenuating signals outside the desired frequency range, wherein the support structure is attached to the resonator so that the resonator is isolated from the support structure during resonator vibration.

2. The method as claimed in claim 1 wherein the step of vibrating includes forcing different portions of the resonator to move in opposite directions at the same time so that the resonator vibrates in a resonant mode, m, higher than the fundamental resonant mode wherein the resonator has m+1 nodal points.

3. The method as claimed in claim 2 wherein the micromechanical filter apparatus includes a plurality of input electrodes spaced along the resonator to allow electrostatic excitation of the resonator and wherein the step of forcing includes the steps of applying an in-phase signal to one of the input electrodes to deflect a first portion of the resonator in a first direction and applying an out-of-phase signal to another input electrode to deflect a second portion of the resonator in a second direction opposite the first direction to force the resonator into a correct mode shape.

4. The method as claimed in claim 2 wherein the micromechanical filter apparatus includes an input electrode formed on the substrate to allow electrostatic excitation of the resonator and wherein the step of forcing includes the step of applying a signal to the input electrode, the resonator and the

input electrode defines a capacitive transducer gap therebetween and wherein the micromechanical resonator further includes m+1 spacers having a height and which extend between the resonator and the substrate at the m+1 nodal points and wherein the m+1 spacers force the resonator into a correct mode shape during the application of the signal to the input electrode.

5. A micromechanical filter apparatus for filtering signals to obtain a desired passband of frequencies, the apparatus comprising:

a substrate;

a plurality of intercoupled micromechanical elements including a resonator; and

a support structure anchored to the substrate to support the elements above the substrate wherein the support structure and the resonator are both dimensioned so that the resonator is isolated from the support structure during resonator vibration wherein energy losses to the substrate are substantially eliminated and wherein the apparatus is a high-Q apparatus.

6. The apparatus as claimed in claim 5 wherein the support structure is attached to the resonator at at least one nodal point of the resonator.

7. The apparatus as claimed in claim 5 wherein the signals are RF signals.

8. The apparatus as claimed in claim 7 wherein the apparatus is an RF filter apparatus.

9. The apparatus as claimed in claim 5 wherein the apparatus is a bandpass filter apparatus.

10. The apparatus as claimed in claim 5 wherein the support structure includes at least one beam attached to a nodal point of the resonator.

11. The apparatus as claimed in claim 5 further comprising at least one input electrode formed on the substrate to allow electrostatic excitation of the resonator wherein the resonator and the at least one input electrode define a capacitive transducer gap therebetween.

12. The apparatus as claimed in claim 11 further comprising at least one spacer having a height, each spacer extending between the resonator and the substrate at a nodal point of the resonator wherein the size of the gap is based on the height of the at least one spacer during pull down of the resonator.

13. The apparatus as claimed in claim 5 wherein the apparatus is a silicon-based filter apparatus.

14. The apparatus as claimed in claim 5 wherein the apparatus is a diamond-based filter apparatus.

15. The apparatus as claimed in claim 11 further comprising at least one output electrode formed on the substrate to sense output of the apparatus.

16. The apparatus as claimed in claim 5 wherein the support structure includes a plurality of beams and the resonator includes a plurality of nodal points and wherein each of the beams is attached to the resonator at one of the nodal points of the resonator so that the resonator sees substantially no resistance to transverse or torsional motion from the support structure.

17. The apparatus as claimed in claim 11 wherein a pair of balanced input electrodes are formed on the substrate to allow electrostatic excitation of the resonator.

18. The apparatus as claimed in claim 15 wherein a pair of balanced output electrodes are formed on the substrate to sense output of the apparatus.

19. The apparatus as claimed in claim 5 wherein the plurality of intercoupled micromechanical elements includes a pair of intercoupled end resonators.

20. The apparatus as claimed in claim 19 wherein the support structure supports the end resonators above the substrate.

21. The apparatus as claimed in claim 19 wherein the plurality of intercoupled micromechanical elements further includes an inner resonator intercoupled to the end resonators.

22. The apparatus as claimed in claim 21 wherein the support structure supports the end and inner resonators above the substrate.

23. The apparatus as claimed in claim 21 wherein the plurality of intercoupled micromechanical elements further include a plurality of coupling links for coupling the inner resonator to the end resonators.

24. The apparatus as claimed in claim 23 wherein the coupling links are operable in multiple modes.

25. The apparatus as claimed in claim 23 wherein the coupling links are higher mode coupling beams.